

CLAIMS

1. The use of a composition in a water system to inhibit the formation of scale at both high (e.g. wellhead) and low (e.g. seabed) temperatures
5 wherein the composition comprises:

(a) a copolymer of an unsaturated phosphonic acid (or salt of such an acid) with an unsaturated sulphonic acid (or salt of such an acid) or an unsaturated carboxylic acid (or salt of such an acid);

10 or

(b) a terpolymer of an unsaturated phosphonic acid (or salt of such an acid) with an unsaturated sulphonic acid (or salt of such an acid) and an unsaturated carboxylic acid (or salt of such an acid).

15 2. The use of a composition in a water system operating under highly alkaline conditions to control the deposition of scale wherein the composition comprises:

(a) a copolymer of an unsaturated phosphonic acid (or salt of such an acid)
20 with an unsaturated sulphonic acid (or salt of such an acid) or an unsaturated carboxylic acid (or salt of such an acid)

or

(b) a terpolymer of an unsaturated phosphonic acid (or salt of such an acid) with an unsaturated sulphonic acid (or salt of such an acid) and an
25 unsaturated carboxylic acid (or salt of such an acid).

3. Use according to Claim 1 or Claim 2 wherein the composition comprises a copolymer of vinylphosphonic acid (VPA) (or a salt thereof) and vinylsulphonic acid (VSA) (or a salt thereof).

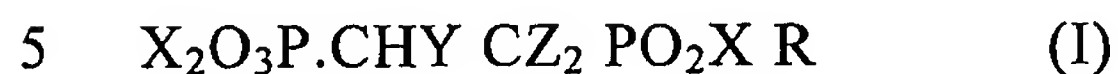
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4. Use according to any preceding claim wherein the composition comprises a 1 : 20 copolymer of VPA and VSA.

5. Use according to Claim 1 or Claim 2 wherein the composition comprises a copolymer of VPA (or a salt thereof) and acrylic acid (AA) (or a salt thereof) or methacrylic acid (MAA) (or a salt thereof).
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- 6 Use according to Claim 1 or Claim 2 wherein the composition comprises a copolymer of vinylidene-1,1-diphosphonic acid (VDPA) (or a salt thereof) and AA (or a salt thereof) or MAA (or a salt thereof).
- 10 7. Use according to Claim 1 or Claim 2 wherein the composition comprises a copolymer of VDPA (or a salt thereof) and VSA (or a salt thereof)
8. Use according to Claim 1 or Claim 2 wherein the composition
- 15 comprises a terpolymer of VPA (or a salt thereof), AA (or a salt thereof) and VSA (or a salt thereof).
9. Use according to Claim 1 or Claim 2 wherein the composition comprises a terpolymer of VPA (or a salt thereof), MAA (or a salt thereof)
- 20 and VSA (or a salt thereof).
10. Use according to Claim 1 or Claim 2 wherein the composition comprises a terpolymer of VDPA (or a salt thereof), AA (or a salt thereof) and VSA (or a salt thereof).
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11. Use according to Claim 1 or Claim 2 wherein the composition comprises a terpolymer of VDPA (or a salt thereof), MAA (or a salt thereof) and VSA (or a salt thereof).
- 30 12. Use according to any one of the preceding claims wherein in the composition any salt of the phosphonic acid, sulphonic acid or carboxylic acid is a wholly-neutralised or partially-neutralised salt.

13. Use according to Claim 12, in which the salt is a sodium salt, a potassium salt or an ammonium salt.
- 5 14. Use according to any one of Claims 1 and 3 to 13 when dependent on Claim 1 comprising the addition to the water system of a scale inhibiting amount of the composition.
- 15 15. Use according to Claim 14, in which the composition is added to the water system in an amount of up to 1000 ppm.
16. Use according to Claim 14 or 15, in which the composition is added to the water system in an amount of from 1 ppm to 200 ppm.
- 15 17. Use according to any one of Claims 14 to 16, in which the system water temperature at the wellhead is in the range 80-200°C and the seabed temperature, is below 40 degrees Celcius and typically as low as 5 degrees Celsius.
- 20 18. Use according to any one of Claims 2 and 3 to 13 when dependent on Claim 2 comprising the addition to the water system of a scale deposition controlling amount of the composition.
19. A water system treated by the use of a composition according to any
25 one of Claims 14 to 17.
20. A water system according to Claim 19, which is operatively associated with an oilfield or oil-well.
- 30 21. A water system treated by use of a composition according to Claim 18.

22. The use in a water system of a composition to control the deposition of scale under highly alkaline conditions wherein the composition has the formula:



where X is H or an alkali metal, alkaline earth or other polyvalent metal, ammonium or an organic base, and R is hydrogen, an alkyl moiety or a group, or polymeric chain comprising between 1 and 100,000 groups, said
 10 group or groups being derived from at least one unsaturated compound in which the multiple bond is activated chemically by an adjacent electron withdrawing group, and Y and Z are each hydrogen, a PO_3X_2 , SO_3X or CO_2X group or an alkyl or aryl moiety.

15 23. Use of a composition according to claim 22 wherein X is H or an alkali metal or ammonia, Y is H, each Z is H, and R is H.

24. Use of a composition according to claim 22 wherein X is H or an alkali metal or ammonia, Y is X_2O_3P- , each Z is H and R is H.

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25. Use of a composition according to claim 22 wherein X is H or an alkali metal or ammonia, Y is H or X_2O_3P- , each Z is H and R is $-CH_2CHYPO_3X_2$.

25 26. Use of a composition according to claim 22 wherein the compound of formula (I) is a telomer and wherein R is a polymeric or copolymeric group formed from at least one monomer selected from unsaturated sulphonic acids, phosphonic acids, carboxylic acids and their water soluble salts.

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27. Use of a composition according to claim 26 wherein the monomer comprises vinyl sulphonic acid and/or its water soluble salt, vinyl

phosphonic acid and/or its water soluble salts, vinylidene diphosphonic acid and/or its water soluble salts or acrylic acid.

28. Use of a composition according to claim 26 or claim 27 wherein the
5 monomer comprises at least one member selected from methacrylic acid, maleic acid, fumaric acid, itaconic acid, mesaconic acid, citraconic acid, crotonic acid, isocrotonic acid, angelic acid, tiglic acid, vinyl alcohol, vinyl chloride, vinyl acetate, styrene sulphonic acid, 2-acrylamido-2 methylpropane sulphonic acid and their water soluble salts.